

# ARC Centre of Excellence in Structural and Functional Microbial Genomics

## From the Director



As 2007 draws to a close, I pause to reflect upon how science has changed over the four decades that I have been involved in research.

The major change that I have observed has been the blurring of boundaries between the various scientific disciplines. Key advances in knowledge are these days made almost invariably by larger, multidisciplinary groups which bring together researchers from a range of backgrounds and with differing expertise.

In biological sciences that may involve expertise in microbiology, biochemistry, bioinformatics, immunology, physics, structural biology, proteomics etc. We are indeed fortunate to have available within our Centre and Associates access to such a diverse breadth of skills, knowledge and capacity, which has made possible some of the high profile research outputs this year.

My thanks go to all Centre scientific and administrative staff, to our post-graduate students and to our associates for their commitment to the Centre and for their hard work over the past 2 years. I am also extremely grateful to the members of our Scientific Advisory Board, who give so generously of their time and provide the benefits of their extensive experience in science, management and commercialisation.

I wish you all an enjoyable, relaxing, and above all, safe break over the next couple of weeks and I look forward to 2008 with both anticipation and excitement.

Ben Adler

Director

## HIGHLIGHTS



### Centre review

In mid November, an external review of the Centre's activities commissioned by the Scientific Advisory Board was undertaken by Professor Glenn Browning, Faculty of Veterinary Science, University of Melbourne and Dr Steve Djordjevic, Elizabeth Macarthur Agricultural Institute, NSW Department of Primary Industries. Thanks to all staff and students for the assistance and cooperation offered to Glenn and Steve during their visit. Their report will be available early in 2008.

### BacPath9

More than 150 people attended the successful biennial BacPath9 conference in September at the Mantra Erskine Beach Resort, Lorne. This year, the Centre sponsored one of the overseas speakers, Dr Carmen Buchrieser, from the Institut Pasteur, Paris. The Centre was also well represented amongst the local speakers, with three Centre Research Fellows giving oral presentations and more than 20 Centre researchers contributing posters. In the conference's tradition of inviting an eminent Australian scientist to speak Centre Director Professor Ben Adler had the honour of giving the plenary lecture on "The surface of *Pasteurella multocida*: genetics, structure and pathogenesis".

The conference, first held in 1992 as a Boden Conference, continues to grow in size and stature attracting an impressive overseas contingent for 2007.

The next BacPath meeting is scheduled for 2009 in South Australia.

### MIIN symposium

The Monash Infection and Immunity Network (MIIN) held a very successful one-day, young researchers' symposium in June, with an attendance of approximately 160 people. The symposium, whose major sponsor was Dow AgroSciences, included researchers from the Monash University faculties of Medicine and Pharmacy, the Burnet Institute and CSIRO. Industry representatives included Pfizer and CSL. The Centre sponsored a poster prize, which was awarded to Lev Kats from the Department of Microbiology, Monash University. Congratulations to Lev and to all the other excellent presenters. MIIN was established in 2005 to facilitate interaction

between researchers working in the broad area of infection and immunity at Monash and affiliated institutes. Centre Director Prof Adler and Centre Associate Prof Paul Hertzog are co-conveners.

MIIN homepage: [www.miin.monash.org/index.html](http://www.miin.monash.org/index.html)

## RESEARCH NEWS



## Immune system's bacterial link

Findings from a collaborative research project co-led by Centre Chief Investigator Professor James Whisstock and Dr Michelle Dunstone have discovered an astounding link between bacterial toxins and immune proteins.

The findings, a culmination of nine years work and published in the prestigious journal *Science* in August, elucidate the structure of a particular protein called Plu-MACPF, one of a large and diverse plant and animal immune protein super family known as perforins. Further, a particular domain in the Plu-MACPF protein exhibits remarkable similarity to a fold in a family of bacterial toxins known as cholesterol-dependent cytolysins or CDCs.

This similarity reveals that it is likely that these two protein families, the perforins or immune proteins and the bacterial toxins, associated with an array of devastating diseases such as anthrax, gas gangrene and scarlet fever, share a common protein ancestor.

This structural similarity poses the key question of whether the perforins which assist in immunity by lysing bacteria, or literally punching holes in bacterial cell membranes, and killing virus infected cells, use a mechanism similar to bacterial toxins. If so, this knowledge can be used to develop new ways of fighting disease.

James and Michelle were also recently interviewed by Robin Williams on *The Science Show* about these findings. A full transcript of this interview can be read at:

[www.abc.net.au/rn/scienceshow/stories/2007/2017457.htm](http://www.abc.net.au/rn/scienceshow/stories/2007/2017457.htm)

Professor Whisstock's lab:  
<http://research.med.monash.edu.au/whisstock/>

## Immune system's lipid recognition method solved

Centre Chief Investigator and Federation Fellow Professor Jamie Rossjohn has been part of collaborative team of Centre and Monash and Melbourne University scientists who have unraveled a 15 year old mystery as to how the immune system fights disease.

These findings published in the international journal *Nature* in June reveal that the team, using synchrotron radiation at the Advanced Photon Source in Chicago, visualized how immune system molecules called NKT T-cells recognize foreign glycolipids or fat fragments that are being presented by another immune system molecule called CD1d. This recognition process subsequently triggers an immune system response.

Until now researchers had only an understanding of how our immune system recognized foreign proteins. The glycolipid recognition mechanism has turned out to be very different.

This discovery is particularly relevant to development of therapies for diseases where glycolipid recognition by T-cells, such as, allergy, atherosclerosis, graft rejection and autoimmune diseases, for example, Type-1 diabetes and some types of cancer, has been implicated.

This research was also supported by the Cancer Council of Australia, the NHMRC, the National Institutes of Health, the Association of International Cancer Research and an ARC Federation Fellowship.

Professor Rossjohn's lab:  
[www.med.monash.edu.au/biochem/staff/rossjohn-lab.html](http://www.med.monash.edu.au/biochem/staff/rossjohn-lab.html)

## STAFF PROFILE



### Wan-Ting Kan

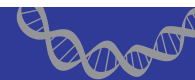
Wan-Ting Kan is a Research Assistant in the Whisstock laboratory in the Department of Biochemistry and Molecular Biology. She is currently working on another MACPF protein (Ting was part of the team which solved the Plu-MACPF protein structure) in the hope that more structural information about how these pore-forming proteins work can be discovered. Other Centre projects which Ting is part of are those associated with plasmid conjugation machinery and bacterial virulence factors.

Ting completed a Bachelor of Biomedical Sciences in 2002 and an honours year in the Whisstock lab in 2003. After finishing honours she worked for 6 months as a RA in the Whisstock lab before going to Hokkaido, Japan for a year to teach English to primary and junior high school students. She returned to the Whisstock lab in mid 2006.

Ting is also currently studying Japanese part-time in a Graduate Diploma in Languages at Monash University, as well as, voluntary tutoring once a week.



## STUDENT PROFILE



### Kwok Wun

Kwok Wun is a Centre PhD student working a Centre innate immunity project on the topic of the energetic importance of the residues on the human semi-invariant NKT T-cell receptor when recognizing the human CD1d molecule presenting glycolipid, galactosylceramide.

The research is a continuation of the highly successful work Professor Rossjohn's group published in Nature in June of this year (refer Research News). Centre Chief Investigator and Federation Fellow Professor Jamie Rossjohn and Dr Natalie Borg are his supervisors.

Kwok, who started his candidature early this year, is originally from Singapore but completed his undergraduate studies at the University of Melbourne and an honours degree with the Biota Structural Biology Group at the Saint Vincent's Institute, Fitzroy.

In his spare time Kwok likes to work on his car which he took over from a friend. Apparently it's a beast but he loves it no less! Since his move from Singapore he has also happily embraced many aspects of Australian culture, especially our practice of enjoying an ice cold beer on a hot summer's afternoon.

Kwok is very proud to be working with the ARC Centre and is immensely grateful for the opportunity the Centre has provided him to pursue his post graduate study ambitions.

## OTHER NEWS



### New Centre Associates

The Centre is pleased to announce the addition of two new researchers to its' Associates line up; Dr Ashley Mansell and Dr Travis Beddoe.

Dr Ashley Mansell, a NHMRC RD Wright Fellow, works with another Centre Associate, Professor Paul Hertzog at the Centre for Functional Genomics and Human Disease at the Monash Institute of Medical Research on the Centre's 'Interaction of bacterial pathogens with the host innate immune system' project.

Dr Travis Beddoe, a NHMRC Peter Doherty Fellow, and senior scientist in Professor Jamie Rossjohn's laboratory works on the Centre's 'Structural biology and drug target characterization' project.

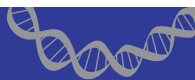
The Centre is grateful to all Associates for their contribution to the Centre's research program.

### Centre Business Development and Commercialisation activities

The Centre is also pleased to announce that its new consultant for Business Development and Commercialization activities is Dr Rocco Iannello. Dr Iannello is a Business Development Manager for the Faculty of Medicine, Nursing and Health Sciences within Monash University's Research Commercialization Unit.

Rocco can be seen at monthly Scientific Committee or CI meetings and is located in STRIP1, Rm G31, (South end) and can be contacted via email [rocco.iannello@med.monash.edu.au](mailto:rocco.iannello@med.monash.edu.au) or phone 9902 0387.

## UPCOMING EVENTS



### Centre Christmas break-up

The Centre Christmas break-up is at 4.00 pm on Tuesday, December 18 at the University Club (Bld 50). All Centre staff, students and associates are encouraged to attend. No RSVP required.

### Project Reports

The next Centre Project Report on 'Vaccine Projects' has been re-scheduled to Tuesday, January 29, 2008 at 2 pm in the Microbiology department seminar room (Bld 53). Drinks and nibbles will be provided afterwards.



The ARC Centre of Excellence in Structural & Functional Microbial Genomics newsletter is compiled and edited by Marianne Johnston. Contributions are welcome and can be forwarded to Marianne via email [marianne.johnston@med.monash.edu.au](mailto:marianne.johnston@med.monash.edu.au) or fax 9905 8241. Marianne is located in STRIP1, Rm G93, (North end), phone number 9905 8610.

The ARC Centre of Excellence in Structural & Functional Microbial Genomics is an Australian Research Council (ARC) funded institute through the Centre of Excellence program. It aims to elucidate key aspects of microbial pathogens and the hosts they infect. The ARC Centres of Excellence are an Australian Government initiative designed to create prestigious hubs of expertise where high-quality researchers can maintain and develop Australia's international standing in research areas of national priority.

Contact us or visit us at: [www.microbialgenomics.net](http://www.microbialgenomics.net)

STRIP1 (Building 75)  
Monash University  
Wellington Rd,  
Clayton, 3800  
Victoria

Phone: 61+ 3 9905 8610

Fax: 61+ 3 9905 4811

Email: [ARCGenomicsCoE@med.monash.edu.au](mailto:ARCGenomicsCoE@med.monash.edu.au)

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